

The characteristics of the brittle deformation structure causing “Crustal strain-rate paradox” in the Niigata-Kobe Tectonic Zone

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Introduction

NKTZ has been known as the high strain rate zone causing right lateral movement and the slip rate of the zone is estimated to 12mm/y by GNSS observation (Ohzono et al., 2011). On the other hand, the total slip rate based on geological survey of the active faults in the NKTZ (the Atostugawa fault, Ushikubi fault and Takayama-Oppara fault) is only 6mm/y. This result is not equal to the result of the GNSS observation. This is called “Crustal strain-rate paradox”. However, the rate of the Kokufu fault zone which is distributed in the southward area of the Atostugawa fault system is not considered when discussing this paradox. The Kokufu fault zone has not yet been investigated by the topographic or geological survey in detail and clarified the brittle deformation structure. The aim of this study is to clarify the brittle deformation structure in and around the Kokufu fault zone by using topographic and geological approaches and discuss what causes the paradox in the NKTZ.

Topographic and Geological Overview

In the study area, active faults such as Unehata fault and Toichigawa fault which is belonging to the Kokufu fault zone are distributed. There are also fault taraces indicating active faults in the Inagoe area. The Hida metamorphic rocks, Tedori formation, Nohi rhyolite, Funatsu granite are distributed in the study area. According to geological map (Geological Survey in Japan, 1975) in the study area, there are many geological faults or geological boundary faults.

Results

In the Miborotani outcrop (Loc.1), the fault is composed of 10 cm yellow-orange fault gouge and fault breccia. Strike and dip of the fault gouge is N65E85S and the plunge of the slickline on the fault surface plunges 10 to the south. This fault outcrop is composed of Unehata fault.

In the Kurigatani outcrop (Loc.2), the fault is composed of 20 cm blue gray fault gouge and fault breccia. Strike and dip of the fault gouge is N25E60S and of the slickline on the fault surface plunges 18 to the south. This fault outcrop is in the area located about 200 meters far away from the active faults.

In the Soutsuitani outcrop (Loc.3), the fault is composed of the fracture zone including fault gouge and fault breccia. Strike and dip of the fracture zone is N89W75N.

Discussion

By the topographic and geological surveys, we found many faults in the off-fault area which is the area far away from the active faults. These faults cause the “Crustal strain-rate paradox”. Therefore, it is important for considering “Crustal strain-rate paradox” to clarify the brittle deformation structure around the Kozkufu fault zone.

Keywords: Niigata-Kobe Tectonic Zone, brittle deformation structure